DTSF-2B+ECO
ELECTRONIC THERMOSTAT FOR SOLAR AND HEATING PLANTS APPLICATIONS WITH CIRCULATION AND THERMO-SYPHON
USER MANUAL

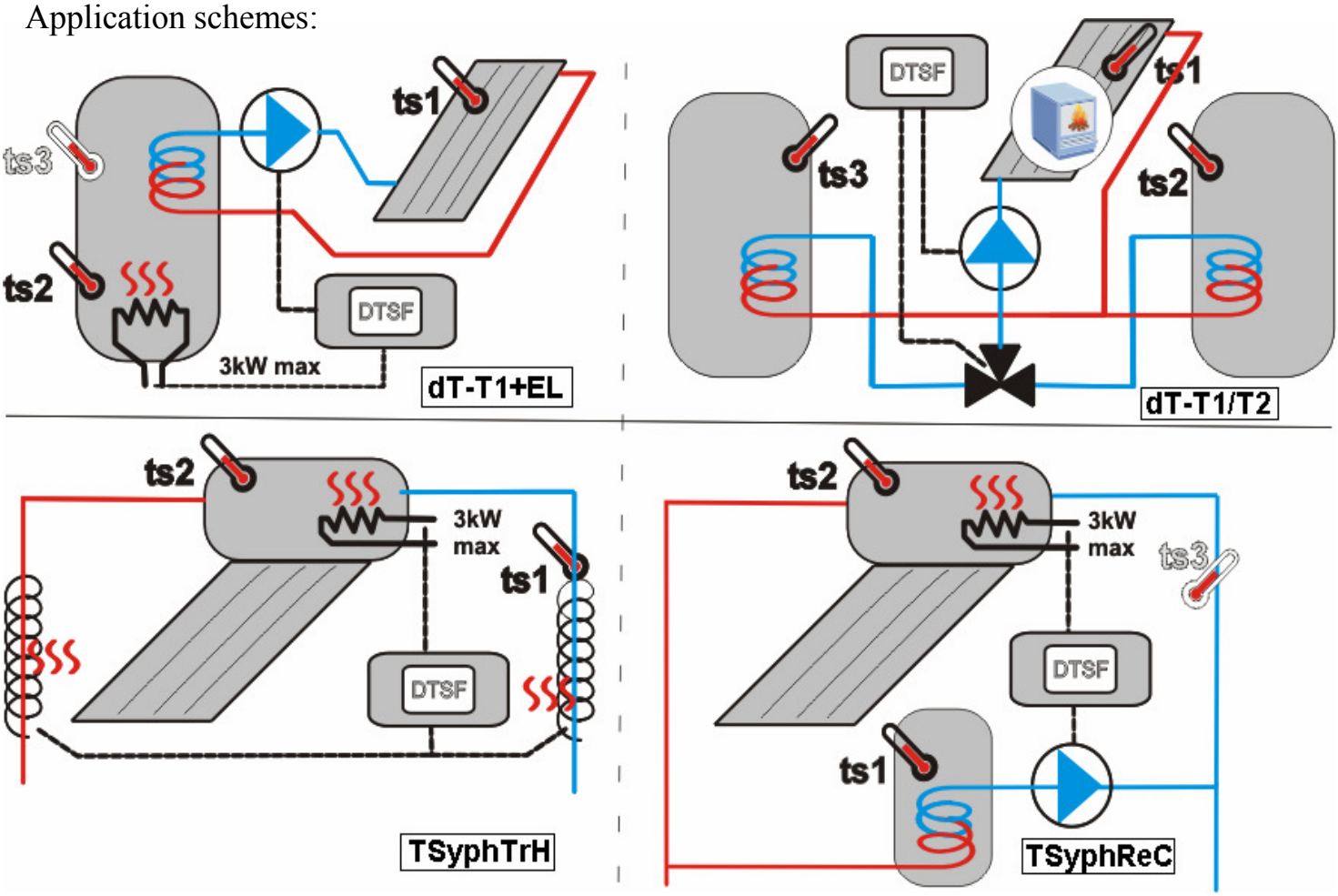
Description

This unit is multipurposed and can be used for systems of thermosyphonic type and with circulation pump:

Solar plants of thermo-syphon type;
- mode1"TSyphTrH" - Tank heater and trace heating
- mode2"TSyphReC" –Tank heater and re-circulation with defrost

With circulation (differential thermostats);
- mode3 "dT-T1+EL" Solar panel + Tank (1/2 probres) with heater
- mode4 "dT-T1/T2" Solar /Boiler + Tank A and Tank B switching

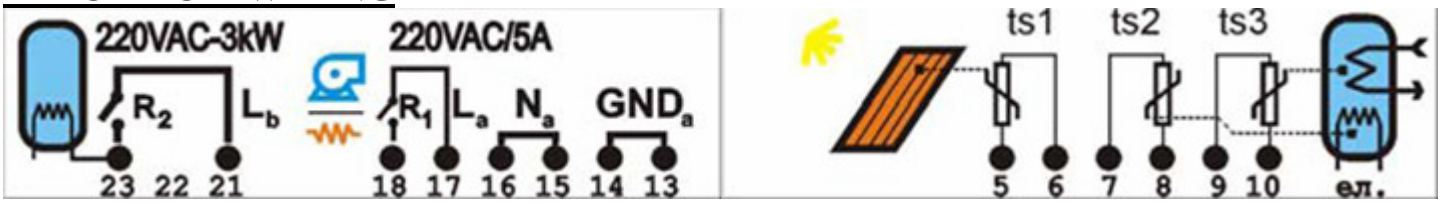
Application schemes:



Features:

1. Controlls directly and separately electric heater and pump/trace heater for defrost.
2. Monitors up to 3 temperaturs, sensors type PTC 1k
3. Fully programmable with 7 parameters and password protection of vital settings.
4. Easy heater mode selection „Auto" /On./ Off./Away (VacancieHollyday) with separate button
5. Real time clock for additional heater activation at low energy rate time zone 22:30 to 05:30h
6. Power supply – 220 V AC, quiescent power <2VA
7. Relay outputs two: with separate relays for individual control of each output:
   - R1 n.o. SPST-5A , supplyes "live" for pump/defrost wire activation of up tp 180W
   - R2 n.o. SPST-16A, for electric heater comutation of up to 3kW (voltage free contact)
8. 2x AAA batteries for clock operation back up.
9. LCD alphanumeric display with 8x2 rows/digits
10. Navigation – by 3 buttons. One separate button for heater control.

ELECTRICAl WIRING



- Power supply 220V AC – (internal and R1) – #17 (Live "La"); #16 („N"); #14"PE"
- R1: Pump/trace heater output – #18 (switched Live); #15 („N"); #13"PE" – 5A max.
- R2: Heater/valve output – #21 (separate Live"Lb"); #23 output – 16A max.
- **Additional external fuses should be conected for protection of the device, for connection of #17 – up to 6A.; #21 –up to 16A. / Connection of heater "N" to be done on other terminal**

- **Warning! All safety devices (armature) required by tank manufacturer should present and shall not be removed in any reason! As DTSF is not a safety device!**

Probes and output conection:

1. Application "TSyphTrH" (ThermoSyphon type with electric heater +trace heating)		
TS1: Trace temperature	**TS2**:Solar Tank temperature	**TS3**: Not used
R1: trace heating		**R2**: electrih heater
2. Application "TSyphReC" (ThermoSyphon type with electric heater +ReCirculation)		
TS1: Extra Tank temperature	**TS2**:Solar tank temperature	***TS3**: trace temperature***
R1: re-circulation pump		**R2**: electrih heater
3. Application "dT-T1+EL" (Solar with circulation pump and electric heater of tank)		
TS1: Solar temperature	**TS2**: Tank temperature B	***TS3**:Tank temperature A***
R1: re-circulation pump		**R2**: electrih heater
4. Application "dT-T1+T2" (Solar/boiler with circulation pump and two tanks A and B)		
TS1: Solar temperature	**TS2**: Tank B temperature	**TS3**:Tank A temperature
R1: circulation pump		**R2**: Tank A / Tank B switch valve

**Optional connection See also application schemes for correct probe connection.

PARAMETERS:

1. „dT" – Temperature difference between solar and tanks for pump activation.

[range 3° C ÷ 35° C]. Fac. default.= 10 ° C; Applications "TSyphReC ,"dT-T1+EL", "dT-T1+T2"

2. „GoodTnk"– Comfort **t°** in tank for additionl heating with electrical heater from 22:30 – 05:30h or switching among TankA and Tank B if application is **"dT-T1+T2"**

[range 5° C ÷ 80° C] Fac. default = +65° C (only if clock is set!;or"dT-T1+T2") Applications ALL

3. „MaxTank" – Maximal allowed **t°** in tanks

[range 30 ° C ÷ 85° C] Fac. default = +85 ° C; Applications ALL

4. „MinTank" – Selected minimal **t°** in tank which is maintained by electrical heater – all the time.

[range 5° C ÷ 60° C] Fac. default = + 38 ° C; Applications"TSyphTrH","TSyphReC","dT-T1+EL"

5. „Min Sol" – Selected minimal **t°** in solar panel to enable circulation according to dT.

[range 5° C ÷ 80° C] Fac. default = +25 ° C; Applications "dT-T1+EL", "dT-T1+T2"

6. „TKDeice" – Activation of pump for defrost of Solar (only if application is **"dT-xx+xx")**

[Range -40° C ÷ 10° C] Fac. default = + 5 ° C; Applications "dT-T1+EL", "dT-T1+T2"

7. "PumpSec" – Pump operation time – minimal or additional time. (Set value above 0 sec. if systems with longer tubing or quick temperature drop after dT- thermal energy should not be lost)

[Range 0 ÷ 60 sec.] Fab. Settings = 0 sec. ; Applications ALL

8. „ActSol" – Active Solar time -maximal delay before activation of heater in „Eco" mode

[range 0 ÷ 250 min] Fac. default = 0 min = off; Application "dT-T1+EL"

OTHER:

Fixed hysteresis 2 º C; Alarm alert by flashing of back light of the screen
R1 and R2 status visualization Manual R1 (pump) test/activation.
Password protection for unauthorized modification of the vital parameters

FUNCTIONAL SCHEMES

Application: **"TSyphTrH"-Thermosiphon with electric heater and trace heating"** - monitors temperatures in the solar tank and pipeline (trace), controls electric heater and trace heating;

1. Trace heating (R1 output) is activated for:
   - Defrost protection of pipeline : TS1 (Solar) < "**5ºC**
2. Heater (R2 output) is activated for additional heating of Tank with electrictric heater if:
   - TS2 < **„MinTank"** and mode is "**Auto**",
   - TS2 < **„GoodTnk"** if mode is "**ON**" or during time zone 22:30–05:30 if mode is "**Auto**"
   If no battery is supplied or clock is not set, the heating from 22 – 06h is ignored!
   - Defros protection of tank if TS2 < **„8 ºC"** and mode is "**OFF**" or "**Holliday**"

Application: **"TSyphRec"-Thermosiphon with electric heater, tank2 heated by re-circulation and pipeline defrost "** - monitors temperatures in the solar tank, tank2 and pipeline (trace), controls electric heater for solar tank heating and re-circulation pump for tank 2 heating and trace defrost.

1. Re-circulation pump (R1 output) is activated for:
   - Normal heat transfer duty if: Minimal "**dT**" is reached: tº difference between the TS2(Solar Tank) and Tank2 (TS1) and TS1 < "**MaxTank**".
   - Defrost protection of pipeline: TS3 (trace *if sensor present*) < "**5ºC** and TS2(Solar Tank)> "**8ºC**.
2. Heater (R2 output) is activated for additional heating of Tank with electrictric heater if:
   - TS2 < **„MinTank"** and mode is "**Auto**",
   - TS2 < **„GoodTnk"** if mode is "**ON**" or during time zone 22:30–05:30 if mode is "**Auto**"
   If no battery is supplied or clock is not set, the heating from 22 – 06h is ignored!
   - Defros protection of tank if TS2 < **„8 ºC"** and mode is "**OFF**" or "**Holliday**"

Application **"dT-T1+EL" -Differential thermostat - 1 tank mode** - monitors temperatures in the tank and collector, controls the circulation pump and electric heater with priority of solar if set;

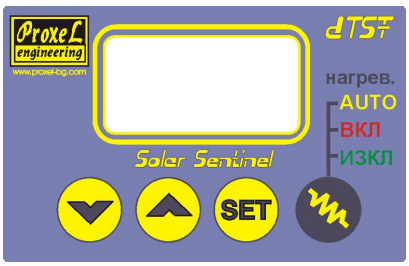
1. Circulation pump (R1 output) is activated for:
   - Normal heat transfer duty if: Minimal "**dT**" is reached: tº difference between the TS1(Solar) and Tank (colder of TS2/TS3) and TS1 > **„Min Sol"** and TS2< "**MaxTank**" and TS3< **"MaxTank.",**
   - If tank is about to overheat, few degrees prior "**MaxTank"** pump is activated only if TS1>100 ºC
   - Defrost protection of solar : TS1 (Solar) < "**TKDeice"** and either TS2 or TS3 >**8 ºC**
   - Overheat protection of solar : TS1 (Solar) > **100 ºC** and TS2 and TS3 < "**MaxTank**"
   - Overheat protection of Tank : if TS2 or TS3 > "**MaxTank**" pump is deactivated.
   - If mode is "**Hollyday**": forced cooling of tank till **„MinTank"** if TS1 < TS2/ TS3 - **10 ºC**
   - Prevention of pump blockage by activating the pump for 1 min every 7 days of inactivity.
   - Overheat protection of panel/pipeline - recovery if solar is overheated (*after power loss*)
   If **TS1** exceeds **140 ºC** the pump activation is prohibited, to protect the system from extreme **tº**.
   If **TS1** is in range of **110-140 ºC** and **tº tank <95ºC,** pump is activated in short intervals of 1 sec. on each 20 sec. for slow recovery till **TS1** is reduced to safe limits.
2. Heater (R2 output) is activated for additional heating of Tank with electrictric heater if:
   - TS2/TS3 < **„MinTank"** and mode is "**Auto**",
   - TS2/TS3 < **„GoodTnk"** if mode is "**ON**" or during time zone 22:30–05:30 if mode is "**Auto**"
   "Eco function" "**ActSol**" - postponement of electrical heater activation to "**GoodTnk**" For the time specified if presence of "sun". If "**ActSol**" is activated - time zone 22-06h can be ignored.
   If no battery is supplied or clock is not set, the heating from 22 – 06h is ignored!
   - Defros protection of tank if TS2/TS3 < **„8 ºC"** and mode is "**OFF**" or "**Holliday**"

Application **"dT-T1+T2 Differential thermostat – TankA /TankB switching"** - monitors tº in Tanks and collector, controls the circulation pump and tank selection valve for tank A/B

1. Circulation pump (R1 output) is activated for:
   - Normal heat transfer duty if: Minimal "**dT**" is reached: tº difference between the TS1(Solar) and selected Tank A or Tank B(TS2 or TS3) and TS1 > **„Min Sol"** and Tanks tº < "**MaxTank**".
   - If tank is about to overheat, few degrees prior "**MaxTank"** pump is activated only if TS1>100ºC
   - Defrost protection of solar : TS1 (Solar) < "**TKDeice"** and either TS2 or TS3 >**8 ºC**
   - Overheat protection of solar : TS1 (Solar) > **100 ºC** and TS2 and TS3 < "**MaxTank**"
   - Overheat protection of Tank : if TS2 or TS3 > "**MaxTank**" pump is deactivated.
   - If mode is "**Hollyday**": forced cooling of selected Tank till **„MinTank"** if TS1< TS2/ TS3-**10ºC**
   - Prevention of pump blockage by activating the pump for 1 min every 7 days of inactivity.
   - Overheat protection of panel/pipeline - recovery if solar is overheated (*after power loss*)
     If **tºsolar** exceeds **140 ºC** the pump activation is prohibited, to protect the system from extreme temperatures.
     If **tºsolar** is in range of **110-140 ºC** and **tºboiler <95ºC,** pump is activated in short intervals of 1 sec. on each 20 sec. for slow recovery till **tºsolar** is reduced to safe limits.

2. Tank selection valve (R2 output) is activated for selection of Tank A(active)/Tank B(not active)
   - if TS2 < **„GoodTnk**" output is "off", Tank B is selected**.**
   - if TS2 > **„GoodTnk**" output is "on", Tank A is selected**.**

USAGE



Pannel description

Generals

- LCD display with two rows
- buttons for navigation - Up- **„↑"("+")**, Down -**„↓"("-")** , and „**Set**"
- button for heater mode selection „**-^v^v-**"
- visible light indication for alarm (backlight blinks)

Usage of buttons:

- buttons **„Up- ↑"/„Dn-↓"**, changing of displayed windows up/down or increment/decrement values, if value edit is selected;
- button „**Set**" toggles between value edit and window change function of **„Up- ↑"** and **„Dn-↓"**,
- button „**-^v^v-**" – selects the required user mode of opperation „AUTO"/ „ON"/ „OFF"/"VAK"

Setting of parameters:

- Select needed parameter by pressing **„Up- ↑"** or **„Dn-↓"** till necessary window is displayed
- Press **„Set**" to enable parameters to be changed. For most of parameters, password is required.
- Change the value of the selected parameter by **„Up- ↑"** or **„Dn-↓"**
- Press **„Set**" to confirm and store changes.
- Other parameter can be selected.

***Note: changing of parameter value is possible after pressing "Set" and value should be displayed in* brackets „[" „]". To confirm press "Set" again. Please provide the password first.**

Available windows and interface with the unit

Window #1 - Main window

Displays: temperatures in Tanks and solar, selected mode, actiovation of outputs (heater and pump).

```
B:XXAUTO
S:YY°C P
```

- **Row 1**: Tank temperature "**XX**", probes "A-TS3" and "B-TS2", heater state – "off/on", unit user mode AUTO/OFF/ON/VAKC. Each one second changes reading of between Tank B and A probes if available (or Tank A and Tank B)

If no sensor is connected label „**no**" is displayd, if sensor is short circuited "**sc**" is displayed

Row 2: TS1 (solar temperature) "**YY**", pump state "P"

- If Mode “AUTO” is selected, “**AUTO**“ is displayed alternatevlly with heater state ”**off”** or **”on”**
- If Mode “ON“ is selected, “**ON**“ is displayed alternatevlly with heater state ”**off”** or **”on”**
- If Mode “OFF” is selected, “**OFF**“ is displayed alternatevlly with heater state ”**off”** or **”on”**
- If Mode “Holliday” is selected, “**VAKC**“is displayed alternatevlly with heater state ”**off”** or **”on”** (if Thermo-Syphon mode is selected, this mode is same as “OFF”)
- if Thermo-Syphon mode is selected on row 2 is displayed the current time. Also labels according to addition operation is displayed: During activation of trace heating lable is “**Defrost**”, during Re-Circulation “**ReCirc.**” Lable is displayed

Manual R1 (pump) activation.

Press and hold **„Up- ↑”** button.

As you press **„Dn-↓”** button pump will remain active. Depress for Stop.

Window #2 - Differential temperatute for pupm activation

```
dT
[ 15°C]1
```

Row 1: Selected parameter is “dT” – temperature difference

Row 2: Parameter’s value. Range 3ºC ÷ 35ºC. , window number-1

** password is required to change this parameter.*

Window #3 - Current time

```
13:04:15
       2
```

Row 1: Current time, “If there is no battery, or time was not set symbol ”!” is displayed.

Row 2: Empty; window number-2, To set time, press **„Set”.** The character „>” or „<” will show which value is about to be changed. To change next value, press **„Set”** again.

Note, heating the tank to “GoodTnk” from 22 – 06 h is allowed only after setting the time.

Set the time: Hour Minutes Seconds Indication if time was not set

```
13<04:15
       2
```

```
13>04:15
       2
```

```
13:04>15
       2
```

```
13:04!15
       2
```

Window #4 - Comfort temperature in tank.

Displays the required comfort temperature achieved by electrig heater during (22:00-06:00) or ECO

```
GoodTnk
[ 65°C] 3
```

Row 1: Selected parameter is “GoodTnk”

Row 2: Parameter’s value. Range 5ºC ÷ 80ºC. , window number-3

For this parameter password is not required and can be changed by user.

Window #5 - Minimal maintained temperature in tank by electric heater all the time.

```
MinTank
[ 38°C] 4
```

Row 1: Selected parameter is “MinTank”

Row 2: Parameter’s value. Range 5ºC ÷ 60ºC., window number-4

For this parameter password is not required and can be changed by user.

Window #6 - Maximal temperature possible in boiler.

```
MaxTank
[ 90°C] 5
```

Row 1: Selected parameter is “MaxTank”

Row 2: Parameter’s value. Range 30ºC ÷ 95ºC. , window number-5

** password is required to change this parameter.*

Window #7 - Minimal temperature of solar panels to enable circulation if dT is achieved.

```
Min Sol
[ 25°C] 6
```

Row 1: Selected parameter is “MinSol”

Row 2: Parameter’s value. Range 5ºC ÷ 80ºC. , window number -6

** password is required to change this parameter.*

Window #8 - Defrost of solar panels.

```
TKdIce
[ 5°C] 7
```

Row 1: Selected parameter is “TKdIce

Row 2: Parameter’s value. Range -40ºC ÷ 10ºC. , window number -7

** password is required to change this parameter.*

Window #9 - Pump run time (minimal or extended/prolonged).

```
Pumpsec
[ 00]sec8
```

Row 1: Selected parameter is "Pumpsec"
Row 2: Parameter's value. Range 0 ÷ 64 sec. (0..128) , window number -8
If value is <64 , the pump run time is not less than "Value" seconds
If value is >64 , the pump run time is prolonged with seconds equal to "Value"-64,
** password is required to change this parameter.*

Window #10 - Active Solar time -maximal delay before activation of heater in „Eco" mode
Показание – време за изчакване за наличие на „слънце" преди активиране на нагревател.

```
ActSol
[ 00]min9
```

Row 1: Selected parameter is "ActSol"
Row 2: Parameter's value. Range 0 ÷ 250 min. If „0" is selected this option is disabled
window number -9
** password is required to change this parameter.*

Window #11 - Password.

```
Passwrd
[00]sec
```

Row 1: Selected parameter is "Passwrd"
Row 2: Password, window number -10
Please provide the password first, to enable parameters change.

Window #12 - Application - operation mode.
Set your application mode – „Differential thermostat" or „Thermo-Syphon".

```
[Mode]  X
[T-Sifon]
```

Row 1: Selected parameter is operating "Mode" , mode number
Row 2: Parameter's value Mode0="TSiphRec", Mode1="TSiphTrh" or Mode2="dT.T1+EL" Mode3="dT.T1/T2",
To change among mode: press **„Up- ↑"-and „Dn-↓"**
** password is required to change this parameter.*

Window #13 - Probe inputs reading calibration (during manufacture).

```
02f90278
03ff  Vid
```

Vid – Software version ID

TECHNICAL DATA

Supply voltage: 220V±10% /50Hz. ≤ 2VA

Temperature range -5T40, RH80%

Sensor ranges: measurement -40ºC÷150ºC;

Display: -40ºC÷150ºC; Withstand 200 ºC

accuracy ±1 ºC if (-5 ºC ÷ +100 ºC); else ±4ºC.

Instalation on DINrail 35mm; to be incorporated

Dimentions 68x85x58 mm. Enclosure type IP20

Outputs:

-R1- 220V - 5A and 180W/AC3 (motor)

-R2- 220V - 16A and 1500W/AC3(motor)

Back up of clock operation with 2x AAA alkaline batteries of up to 90 days

INSTALATION AND SERVICE

Warning! Possible Electric Shock.
All commissioning, installation and maintenance sevices must be done with power switched off to all terminals.

Warning! While connecting the electric heater of the tank - keep all necessary safety, protection and switching elements of the tank (switch, thermo-regulator, thermal protection) as required by tank manufacturer.

Caution! The unit is made to be incorporated and installed in appartament cabinet with over 4 poles and is attached to standard DIN rail 35mm

Caution! Additional external fuses should be conected for protection of the device, for terminal #21 –up to 16A, for terminal #17 – up to 6A.

How to replace batteries:

1. Switch off all power supply to the unit.
2. Open the upper part of the body by pressing the lock tabs at both sides of the base.
3. Replace old ones and install new ones while observing the polarity.
4. Install the upper part of the body till completely fitts and snaps to the base.

**Installation of batteris in wrong polarity will not damage the device.*

Warranty:
Product warranty period is 24 months from the date of sale or installation, but not more than 28 months from the date of manufacture.
The warranty covers defects attributable to the manufacturer (manufacturing defects or faulty materials).
Not covered by warranty maintenance defects due to improper or unqualified installation, interference to device, natural disasters, non-standard power supply, improper storage or transport dead or missing battery.
Product should be stored without batteries installed!